The Global Language of Business

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Federal Communications Commission
45 L Street, NE
Washington, D.C. 20554

Re: Request for Comments: WT Docket No. 24-240

Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on NextNav Petition for Rulemaking

GS1 US® appreciates the opportunity to provide these comments to the Federal Communications Commission (FCC) on the Wireless Telecommunications Bureau and Office of Engineering and Technology: Seek Comment on NextNav Petition for Rulemaking - Docket No. 24-240 (petition). Within this document are general comments and answers to petition questions or topics.

EXECUTIVE SUMMARY

GS1 US is a neutral, not-for-profit information standards organization with more than 300,000 members in the United States. Industry members affiliated with GS1 US have concerns and questions regarding the NextNav rulemaking petition and supplemental letter[1] to the FCC to realign the 902-928MHz band. The essential questions and concerns relate to concerns:

- Increase to full macro power limits for 902-907 MHz and 918-928 MHz
- Remove preferential treatment for unlicensed operations
- Eliminate testing requirements of current rule section 90.353(d)(30)

The proposed increase of power would significantly impact the RFID technology, which is classified under the Part 15 device category. Passive Radio Frequency Identification (RFID) tags operate in the 902-928 frequency range in the USA. Such tags are regulated by a single global standard called GS1 UHF EPC Gen2[2], which was adopted by the International Standards Organization as ISO/IEC 18000-63). These tags are also referred to as UHF RFID or RAIN RFID tags. The proposal could negatively impact domestic and global supply chains, disrupt U.S. business operations, and increase the risk of issues on basic consumer/patient health and safety services and products.

Below are comments from GS1 US on the impacted industries and responses to key FCC questions and topics covered in the NextNav petition.

GS1 US COMMENTS ON IMPACTED INDUSTRIES

As noted above, GS1 US is a neutral, not-for-profit information standards organization with more than 300,000 members in the United States. It develops as well as administers the use of GS1 Standards, the most widely used supply chain standards in the world, considered by many to be the "language of U.S. and global supply chains". GS1 Standards provide clarity, consistency, and interoperability in identifying, capturing, and sharing information electronically across state, regional, and global supply chains.

Our members rely on the GS1 system of standards daily to create a common data language between systems and businesses. Every day, over 10 billion GS1 standards-compliant barcodes are scanned, most of which are composed of products traversing the supply chain and through point-of-sale. A subset of those uniquely identified products are also RFID tagged, enabling an open and interoperable means of uniquely identifying products and specific product instances (items). The RFID technology not only provides unique, item-level, identity, but it provides a means of automatically capturing precise data without line-of-sight scanning as required by barcodes. This contributes significantly to effective inventory management and supply chain visibility.

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[1] https://www.fcc.gov/ecfs/search/search-filings/filing/10607137757430

[2] https://www.gs1.org/standards/rfid/uhf-air-interface-protocol

Our members are also seeing an increase in consumer and trading partner demands, so effective inventory management is vital. Successful inventory management involves striking the balance between maintaining an adequate supply of products while avoiding excessive inventory. By achieving this, businesses can save on cost, reduce waste, enhance customer satisfaction, and grow the business[3].

GS1 US stands by the FCC’s 2013 decision not to adopt new rules impacting the 902-928 MHz band and believes this ruling remains valid. Additionally, the lack of a comprehensive technical and market analysis makes it truly challenging to effectively respond to some of the FCC’s questions. Upon speaking with several key stakeholders, many are choosing not to respond due to the short timeframe.

GS1 US, as a 501(c)6, was created by industry for the industry and acts as a great convener for companies to solve business challenges. One example of this was the development of the GS1 US RFID Claims Compliance Guideline for the Apparel Industry[4]. This brought numerous companies together and resulted in over 400 hours spent on the creation of this document, which outlines how the RFID technology is applied for advanced supply chain visibility challenges.

Below, we explore how a few of these industries utilize RFID technology, the benefits they experience, and the potential impacts of the NextNav petition on their operations and business success.

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[3] https://www.gs1us.org/supply-chain/rfid/what-is-rfid-inventory-management

[4] https://www.gs1us.org/content/dam/gs1us/documents/industries-insights/by-industry/apparel-general-merchandise/guideline-toolkit/GS1-US-Claims-Compliance-Implementation-Guideline-for-the-Apparel-Industry.pdf

Healthcare:
The proposed changes by NextNav to reconfigure the 902-928 MHz band could have significant implications for consumer health and safety. The U.S. healthcare system is reliant on RFID technology and any disruptions to these systems could lead to several adverse effects. RFID technology allows healthcare providers to get medications and devices to patients at the right time and expired drugs out of rotation.[5] RFID tracks and manages medical devices, instruments, implants, consumables, and waste. It is also used to monitor and optimize the location, availability, and utilization of healthcare resources, such as beds, carts, staff, and rooms. Using RFID to track equipment has proven to reduce the time spent searching for items by 63%, increase equipment utilization by 34%, and decrease rental costs by 67%.[6] RFID is used to support clinical workflows, such as medication administration, blood transfusion, specimen collection, and surgical procedures. Using RFID to track surgical sponges reduced the incidence of retained foreign objects by 93% in studies.[7]

With RFID integrated in the healthcare space, it is no surprise that it is expected to grow from $35 billion in 2020 to $84 billion by 2027, at a compound annual growth rate of 13.4%.[8]

Benefits of RFID in healthcare include:

- Improve patient safety by ensuring the timely and accurate delivery of medications, mistake-proofing of operations such as detecting expired or recalled drugs and reducing the risk of kitting or handling errors.[9]
- Hospitals and clinics can effectively track and manage inventory of medical devices and supplies, preventing shortages and/or overstock situations.

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[5] https://www.gs1us.org/industries-and-insights/by-industry/healthcare/standards-in-use/pharmaceutical/fresenius-kabi

[6] https://www.sciencedirect.com/science/article/abs/pii/S0925527311004105

[7] https://www.sciencedirect.com/science/article/abs/pii/S1072751514003846#:~:text=Five%20organizations%20that%20implemented%20RF%20technology%20between%202008,5%20organizations%20that%20do%20not%20use%20RF%20technology

[8] https://www.marketsandmarkets.com/Market-Reports/healthcare-and-pharmaceuticals-asset-management-market-1195.html

[9] https://eagile.com/wp-content/uploads/2020/12/GS1US-Fresenius-Kabi-CaseStudy-111820-hi-res.pdf

- Healthcare facilities streamline workflows through numerous applications, including managing surgical instruments, support staff and patient workflows, and automating replenishment and billing.

- Using RFID tags on pharmaceutical items allows for automated ordering and tracking of inventory, reducing management and waste-related costs.

If approved, the NextNav petition could have severe repercussions for the U.S. healthcare sector. The disruption of RFID systems could lead to delays in medication delivery and increase the risk of errors and inefficiencies in inventory management. This could ultimately compromise patient safety and the overall quality of care provided by healthcare facilities.

Retail:
Retailers are currently facing extreme pressure due to intense competition from e-commerce, inflation, higher wage demands, and labor shortages stemming from the Great Resignation. Inflation reached a 40-year high in June of 2022. The efficiencies offered by RFID technology are needed to be competitive in the global marketplace.

The retail industry leverages RFID technology to manage logistics, inventory, and tracking of products. The RFID industry reported a 32% increase (or 44.8 billion) in tags shipped globally in 2023.[10] The technology provides an automated means of detecting and tracking products at the item level and provides each product with a globally unique identifier. This brings significant operational benefits to ensure the right product is at the right place at the right time. It removes inefficiencies which benefits businesses, consumers, and society as it reduces stock, rework, and waste. It also provides a means to detect and respond to product theft and address various supply chain issues (such as product authenticity, grey market, and claims compliance).

Measuring the impact of RFID in retail can be further understood by the key lessons learned from a UK report based on 10 companies with combined regional sales of 94 billion euros and annual tag consumption of 1.8 billion RFID tags. The report includes benefits found in sales lift, optimized stockholding, and customer satisfaction.[11] If U.S. companies are no longer able to use the RFID technology, because of the NextNav petition, it could put them at a competitive disadvantage.

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[10] https://www.rfidjournal.com/news/shipment-of-rain-rfid-tag-chips-surged-to-44-8-billion-in-2023/202583/

Benefits of RFID in retail include:

- Real-time inventory management can be automated, reducing errors, ensuring shelves are stocked, and reducing mundane counting tasks.
- Improved inventory accuracy enables reduction in safety stock, reducing working capital and reducing excess product production, movement, and unsold items.
- Improve chargeback process reducing disputes and improving vendor relations through enhanced accuracy of shipped goods.
- Streamline order fulfillment processes.
- Improve tracking and tracing of individual products.
- Reduce monotonous and error-prone tasks.
- Improve forecasting accuracy, enabling suppliers to plan production more efficiently and reduce the "bullwhip effect" on production variability.
- Enhance the shopping experience through personalized recommendations and faster checkouts.

The approval of the NextNav proposal could significantly disrupt the retail sector, where RFID plays a crucial role in the aforementioned areas. A potential shutdown of RFID systems might result in higher operational costs, reduced inventory accuracy, and substantial delays in supply chain processes, ultimately impacting both retailers and consumers.

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[11] https://www.ecrloss.com/research/utilising-rfid-in-retailing-insights-on-innovation and https://www.gs1uk.org/sites/default/files/inline-files/gs1_uk_the_impact_of_rfid_report.pdf

Foodservice:
Foodservice supply chains are very complex and the need for operational efficiency is paramount. As an example, one of the largest diversified foodservice suppliers in the US leverages the RFID technology since they are serving over 125,000 restaurants in more than 50 countries across five continents[12]. This supplier requires a seamless fusion of data and automation to drive their supply chains. RFID technology significantly improves their ability to track, trace, and monitor case-level end-to-end visibility by sharing digital product data with trading partners in a hands-free, automated manner[13].

Benefits of RFID in foodservice include:[14]

- Enables real-time monitoring of product conditions to ensure product freshness and inventory accuracy.
- Reduces manual checks and leads to faster service and delivery times by speeding up processes.
- Ensure that food safety standards are met, and any issues can be quickly identified and addressed.
- Reduction in food waste by optimizing inventory and shelf-life management.
- Faster service and fresher products, leading to a better overall experience for the customer and bolstering brand loyalty and satisfaction.
- Significant cost savings in labor, inventory management, and waste reduction.

Every year one-third of all food is lost or wasted, over a billion metric tons. The estimated economic cost is around $940 billion annually. Of that waste, 8-10% of global greenhouse gas emissions are from unconsumed food. Of all global food production, 5% is wasted by foodservice, and 2% is wasted by retail grocery.[15] RFID technology has been identified as a means to minimize food waste.[16]

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[12] https://www.gs1us.org/industries-and-insights/case-studies/golden-state-foods

[13] https://www.youtube.com/watch?v=0FyyxJ6qgmM

[14] https://restauranttechnologynews.com/2024/05/chipotle-rolls-out-rfid-technology-to-improve-supply-chain-visibility-and-restaurant-inventory-management/

The approval of the NextNav petition could disrupt the foodservice industry's ability to improve operational efficiencies and remain competitive. In fact, one national foodservice chain asked all their suppliers to tag products with RFID[17]. GS1 US is aware of multiple RFID pilot projects in the foodservice and retail grocery environments. Disruptions in real-time monitoring and inventory management could slow down processes, increase manual checks, and increase operational costs. This could also lead to operational inefficiencies, increased costs, customer dissatisfaction, and compromised food safety. Delays and inefficiencies might result in slower service and less fresh products, negatively impacting brand loyalty and the customer experience. Compromised monitoring of product conditions could jeopardize food safety standards and pose a health risk to consumers. Given the complexity of foodservice supply chains and the role of RFID technology, these potential negative impacts underscore the need for the FCC's careful consideration to protect industry's efficiency and safety standards.

Government

The U.S. government has been an active user of RFID technology. Various departments use RFID technology in different ways. For example, the Department of Defense (July 2004) mandated case-level RFID tagging. GS1 US has worked with the DoD on their "Identification Marking of U.S. Military Property" standard, also known as MIL-STD-130[18]. This standard also discusses the use of tags and radio receivers for asset identification. GS1 Standards, as well as the benefits of RFID, are detailed in the *United States Department of Defense Suppliers' Passive RFID Information Guide*[19]. GS1 US recommends that the FCC consult with the DoD to understand the potential impacts of the NextNav petition on their operations.

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[15] https://www.unep.org/resources/report/unep-food-waste-index-report-2021

[16] https://restauranttechnologynews.com/2024/05/chipotle-rolls-out-rfid-technology-to-improve-supply-chain-visibility-and-restaurant-inventory-management/

[17] https://restauranttechnologynews.com/2024/05/chipotle-rolls-out-rfid-technology-to-improve-supply-chain-visibility-and-restaurant-inventory-management/

[18] https://www.mil-std-130.com/media/pdf/specs/mil-std-130n.pdf and https://www.acq.osd.mil/log/LOG/.AIT.html/DoD_Suppliers_Passive_RFID_Info_Guide_v15update.pdf

[19] https://www.acq.osd.mil/log/LOG/.AIT.html/DoD_Suppliers_Passive_RFID_Info_Guide_v15update.pdf

The integration of RFID technology by the DoD underscores its importance and exemplifies U.S. government use. As the FCC considers the NextNav petition, it is imperative to understand the significant benefits RFID provides to these departments and others. For example, the Auburn University RFID lab held a board meeting at the Kennedy Space Center in 2023, in which significant discussions with NASA representatives ensued about RFID tagging space-bound inventory. GS1 US suggests engaging with all federal entities to understand the broader impacts of the NextNav petition.

GS1 US's Responses to FCC questions and comments

FCC Section: Identification and protection of incumbents

We also invite comment on the status of any outreach with primary federal and non-federal incumbents.

GS1 US **is unaware** (at the time of writing these comments) of NextNav conducting any type of outreach with GS1 US or other key stakeholders.

GS1 US is a 501(c)(6) organization that is industry driven with over 300,000 members. We have informed several members and other constituents of the FCC NextNav petition. GS1 US has also informed DoD and NIST of the FCC NextNav petition.

We seek comment on potential impacts, including details regarding incumbent relocation, whether any incumbents could continue to operate in the proposed 11 MHz segment of the band where currently located, and any information on the status of discussions between NextNav and non-M-LMS incumbents.

To date, NextNav has not requested the input of GS1 US or the members with which we have spoken. Due to the accelerated nature of this comment period, the ability to develop and test impacts such as sideband emissions with any academic rigor is not possible by our members. A limited and preliminary technical analysis performed by the RAIN Alliance indicates that:

1. NextNav base stations will cause *significant interference with RFID Readers which are within ~14 kilometers in rural areas or within ~11 kilometers in urban areas*, rendering RFID deployments unusable.

2. *RFID deployments of a single reader will interfere with NextNav mobiles located within 1 kilometer*. The NextNav rule-making petition request for preferential treatment would mean that these RFID deployments would be shut down.[20]

We seek comment on the extent of part 15 devices and amateur operations in the band and what potential impact band reconfiguration and flexible use rules, including elimination of the testing requirements of current rule section 90.353(d)(30) might have on part 15 devices and on the amateur community.

When considering the impact of the band reconfiguration we should keep the following in mind:

Over 200 billion RFID tag chips have shipped to date, with approximately 40% of those deployed in the USA. As an "internet of things", this means 80 billion items have been RFID tagged in the US, and the data from these tags has served to increase supply chain resilience through digital transformation in sectors including retail, logistics, healthcare, pharmaceuticals, automotive, aviation, smart manufacturing, food safety, energy, smart cities, and others.

Elimination of testing requirements could potentially be catastrophic. The "*ability to demonstrate through actual field tests that their systems do not cause unacceptable levels of interference*[21]" protects the incumbents already situated within the band from potential disruption due to interference. Field tests ensure all environmental factors are accounted for and existing participants in those frequencies will not be effected.

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[20] https://rainrfid.org/quantifying-the-impact-of-the-nextnav-rule-making-petition/

[21] https://www.ecfr.gov/current/title-47/chapter-I/subchapter-D/part-90#90.353

What services are being provided by part 15 devices and amateur operations in this band?

Part 15 devices include RFID which is a crucial technology that strengthens the efficiency and resilience of American Supply chains, as described in the Executive Order on Resilient Supply Chains of June 2024[22].

Services being provided include:

- Provides operational efficiencies to ensure America's world-class manufacturing stays competitive.
- Enables track and trace of product movement not only internally, but also within supply chains.
- Protects patients from expired or wrong medications through proper identification.
- Dependable transportation system
- Enhanced security for critical infrastructures
- Ensure adequate stockpiles
- Reliable food systems

Industry sectors impacted include retail, logistics, healthcare, pharmaceuticals, automotive, aviation, smart manufacturing, food safety, and energy smart cities. Additional information and references are listed above. A subset of solution providers may be found on the GS1 US Solution Partners page[23].

Can they be accommodated in other spectrum bands?

Relocating part 15 devices to different spectrum bands would be costly, time-consuming, and harmful to RFID systems. This would require current participants to upgrade or replace RFID readers and antennas. Additionally, while some of the tags currently used could be capable of continuing to function after the spectrum swap those tags would be less efficient and reliable as they would be working outside of their designed parameters. Many tags, designed for use with liquid-based products, like those used in healthcare applications, would cease to work as they have been tuned to meet the rigors of their environment.

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[22] https://www.whitehouse.gov/briefing-room/statements-releases/2024/06/14/executive-order-on-white-house-council-on-supply-chain-resilience/

[23] https://spfinder.gs1us.org/home?TechnologyQueryCriteria.TechnologyOptions=6

What are the costs for relocation and how long would it take?

It is difficult to estimate the sizable costs for relocation given the pervasive use of this technology. There is not a registry identifying all users of the technology. Because passive RFID tags do not have a battery, they can be used for many years. While many RFID tags are applied to consumer soft goods such as apparel, or hard goods such as tires or car batteries, there are industrial applications such as tool tracking[24], WIP[25], or parts tracking[26] that leverage a large population of RFID tags throughout an asset's life.

Requests and Questions for FCC

1) GS1 US's members would like to review NextNav's technical analyses regarding the impact to RFID technology.
2) GS1 US has observed that the brief time frame allocated for responding to the FCC request for comment has impacted certain stakeholders' ability to respond.

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[24] https://www.aerospacemanufacturinganddesign.com/article/rfid-for-mro/

[25] https://www.corerfid.com/rfid-applications/manufacturing-2/

[26] https://www.rfidjournal.com/news/airbus-to-rfid-tag-and-track-all-parts-made-in-house/74321/

Additional Resources and Case Studies (abridged):

The following guidelines and case studies are further indicators of industry investment and benefits found in GS1 standards-based use of the RFID technology.

Food:

- Asparagus supply chain: https://www.gs1.org/docs/news/Asparagus-case-study-APEC.pdf and https://www.youtube.com/watch?v=aOp8tHIYmU4
- Tequila supply chain: https://www.gs1.org/insights-events/case-studies/case-studies/strengthening-tequila-supply-chain-integrity-mexico-us
- Metro Group Traceability: https://www.gs1.org/sites/gs1/files/case_study_library_item/gs1_metro_traceability_sustainability_case_study.pdf
- Foodservice Implementation guideline: https://www.gs1us.org/content/dam/gs1us/documents/industries-insights/by-industry/food/standards-in-action/GS1%20US%20RFID%20Foodservice%20Implementation%20Guideline%20R1.0%20June%2029%202023.pdf

Apparel and General Merchandise:

- MIT Auto-ID Laboratory and GS1 US Joint Publication: https://documents.gs1us.org/adobe/assets/deliver/urn:aaid:aem:da983889-a64a-491c-bcb8-004f02d27ac3/GS1-US-Retails-RFID-Evolution-Whitepaper.pdf
- Southern Fried Cotton (small business brand owner) case study regarding claims compliance: https://documents.gs1us.org/adobe/assets/deliver/urn:aaid:aem:9ee33d69-5223-4c16-82eb-2f442fd47a9e/sfc-case-study.pdf

- Decathlon Case Study (large multinational, vertically integrated): https://documents.gs1us.org/adobe/assets/deliver/urn:aaid:aem:6ce6a8e6-bb01-4070-8f2e-da42660df7c3/Case-Study-Global-Retail-Sporting-Goods-Leader-Finishes-First-with-RFID.pdf

- Supply chain study: https://www.gs1us.org/content/dam/gs1us/documents/industries-insights/case-studies/apparel-general-merchandise/Case-Study-Executive-Summary-EPC-RFID-Retail-Supply-Chain-Data-Exchange-Study.pdf

Healthcare:

- Pharmaceutical Cold Chain Whitepaper: https://www.gs1us.org/articles/pharmaceutical-cold-chain

- Implementation Guideline: https://www.gs1us.org/content/dam/gs1us/documents/industries-insights/by-industry/healthcare/guideline-toolkit/Implementation-Guideline-for-RFID-in-Healthcare-Manufacturing.pdf

General Resources:

Media Outlet:	www.rfidjournal.com
The RAIN Alliance:	https://rainrfid.org/
AIM Global:	https://www.aimglobal.org/
GS1 Global Office:	https://www.gs1.org/standards/rfid
GS1 US:	https://www.gs1us.org/ and https://site.gs1us.org/rfid.html

Related (US-based) University Resources and Labs:

Auburn University	https://rfid.auburn.edu/
Michigan State University	https://axia.msu.edu/rfid-innovations/
Massachusetts Institute of Technology	https://autoid.mit.edu/
University of Memphis	https://www.memphis.edu/autoid/
California Polytechnic State University	https://polygait.calpoly.edu

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